

# WATER RESOURCES REVIEW for

MAY  
1974

UNITED STATES  
DEPARTMENT OF THE INTERIOR  
GEOLOGICAL SURVEY

CANADA  
DEPARTMENT OF THE ENVIRONMENT  
WATER RESOURCES BRANCH

## STREAMFLOW AND GROUND-WATER CONDITIONS

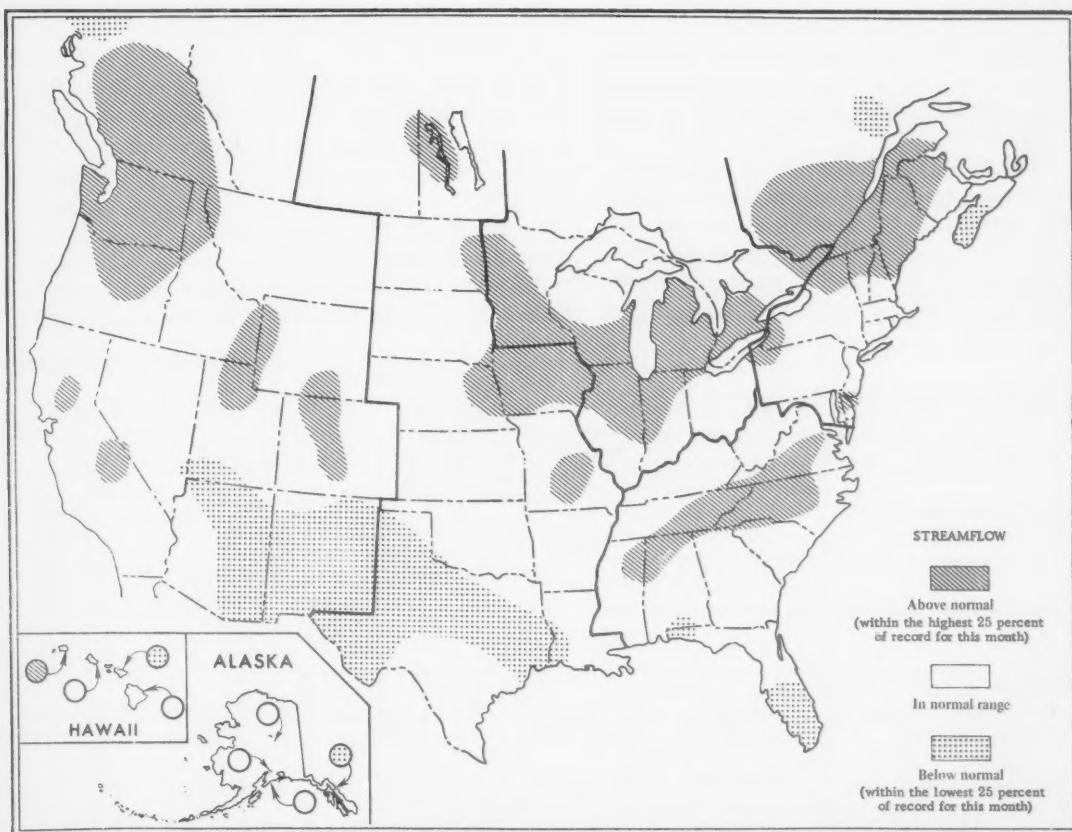
Streamflow decreased seasonally in most of the United States, and increased seasonally in southern Canada, and in parts of several central and western States.

Above-normal flows persisted in large areas in the north-central and northwestern parts of the United States and southwestern Canada.

Flows remained below the normal range in parts of Alaska, Arizona, Florida, New Mexico, and Texas.

The combined flow of the Columbia, Mississippi, and St. Lawrence Rivers, representing runoff from 1.7 million square miles in the two countries, was about average for this time of year, and 35 percent less than a year ago. Flow of the Mississippi River near Vicksburg, Miss., was below median for the first month since June 1972.

Flooding occurred in New Brunswick, Ontario, and Quebec, in southern Canada, and in parts of Illinois, Indiana, Iowa, Louisiana, Maine, Michigan, Minnesota, Missouri, New York, North Dakota, and Oklahoma. At monthend, a critical flood potential existed in many high-altitude stream basins in northwestern States because of above-average snowpacks and delayed snowmelt in those areas.



CONTENTS OF THIS ISSUE: Northeast, Southeast, Western Great Lakes region, Midcontinent, West, Alaska, Hawaii; Basic data reports on quality of surface water; Usable contents of selected reservoirs near end of May 1974; Flow of large rivers during May 1974; Ground water in the Eugene-Springfield area, Willamette Valley, Oregon.

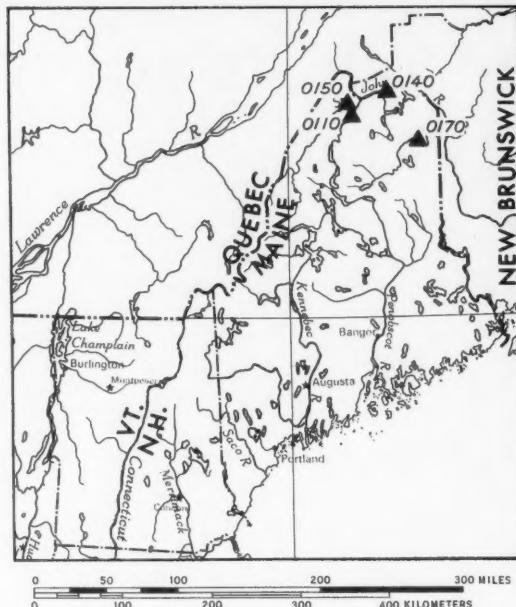
NORTHEAST

[Atlantic Provinces and Quebec; Delaware, Maryland, New York, New Jersey, Pennsylvania, and the New England States]

STREAMFLOW GENERALLY INCREASED SEASONALLY IN THE NORTHERN PART OF THE REGION, EXCEPT IN SOUTHERN NOVA SCOTIA, AND DECREASED SEASONALLY IN THE CENTRAL AND SOUTHERN PARTS. FLOODING OCCURRED IN MANY BASINS IN SOUTHERN QUEBEC, IN NORTHERN BASINS IN MAINE AND NEW BRUNSWICK, AND ALONG SEVERAL SMALL STREAMS IN WESTERN NEW YORK.

In northern Maine, snowmelt runoff, augmented by about 2 inches of rain during the period April 29 to May 4, caused record, or near-record, stages and discharges on St. John, Allagash, and Aroostook Rivers. The accompanying table and map show peak stage and discharge data and locations of selected measurement sites in the flood area. The peak stage in Ft. Kent was the highest in 48 years. Flood damage in that city was estimated at about \$2 million and more than 350 persons were evacuated from their homes. Flooding occurred concurrently along St. John River in adjacent areas of New Brunswick. Much of the damage in the flood area was attributed to the forming and breaking of ice jams and the unusually heavy ice flows.

Rapid runoff from snowmelt and rain also caused extensive flooding along many streams in southern Quebec during May. In St. Francois River basin, between northern New Hampshire and the St. Lawrence River, the daily mean discharge of 59,000 cfs May 1, and the monthly mean discharge of 25,800 cfs (290 percent of



**Location of stream-gaging stations described in table of peak stages and discharges on page 2.**

median) at the index station at Hemming Falls (drainage area, 3,710 square miles) were highest for May in record that began in 1925. Similarly, in St. Maurice River basin (north of the St. Lawrence River), where temperatures during April were below normal and snowpack on May 1 was much greater than average, rapidly rising temperatures and rain near mid-May resulted in a daily mean discharge of 182,000 cfs May 17, and a monthly mean discharge of 174,000 cfs at the index station at Grand

**Provisional data; subject to revision**

**STAGES AND DISCHARGES FOR THE FLOODS OF APRIL-MAY, 1974 AT SELECTED SITES IN MAINE**

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known			Maximum during present flood				
				Date	Stage (feet)	Dis- charge (cfs)	Date	Stage (feet)	Discharge		Recur- rence interval (years)
									Cfs	Cfs per square mile	
MAINE											
ST. JOHN	RIVER BASIN										
1-0105	St. John River at Dickey . .	2,700	1946-	May 10, 1969	17.35	75,400	Apr. 29	18.67	87,200	32.3	100
1-0110	Allagash River near Allagash.	1,250	1931-	Apr. 29, 1973	12.33	29,400	May 1	11.71	26,400	21.1	50
1-0140	St. John River below Fish River, at Fort Kent.	5,690	1926-	Apr. 30, 1973	25.76	136,000	1	26.95	148,000	26.0	200
1-0170	Aroostook River at Washburn.	1,652	1930-	Apr. 30, 1973	13.68	43,100	1	13.14	39,800	24.1	50

Mere (drainage area, 16,200 square miles), both of which were highest for May in 74 years of record.

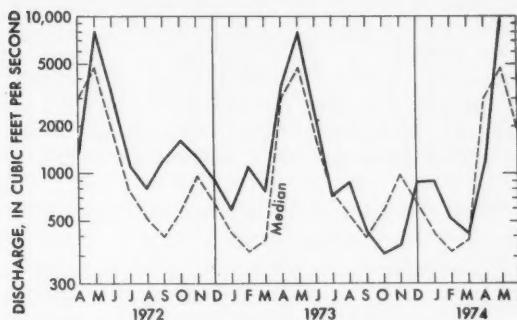
In northern New Brunswick, monthly mean flow of Upsilonquitch River at Upsilonquitch increased sharply, from below the normal range and only 40 percent of median during April, to above that range and twice the median during May (see graph). In contrast, flow of

range in nearly all of northern New England and northern and central New York State, as well as in western Massachusetts and in part of east-central Pennsylvania. Levels were below normal in north-central Pennsylvania. In Vermont, monthend levels in several wells were at or near the highest levels reached at any time in the past 7 years.

## SOUTHEAST

[Alabama, Florida, Georgia, Kentucky, Mississippi, North Carolina, South Carolina, Tennessee, Virginia, and West Virginia]

STREAMFLOW DECREASED SEASONALLY IN MOST PARTS OF THE REGION BUT INCREASED SLIGHTLY IN SOUTHERN FLORIDA AND IN A FEW BASINS IN NORTH CAROLINA, VIRGINIA, AND WEST VIRGINIA. FLOWS WERE ABOVE THE NORMAL RANGE IN NORTH CAROLINA AND THE ADJACENT AREA OF TENNESSEE, AND IN PARTS OF MISSISSIPPI AND VIRGINIA, AND WERE BELOW THAT RANGE IN NORTHWESTERN AND SOUTHERN FLORIDA. FLOODING OCCURRED IN PARTS OF TENNESSEE.



Monthly mean discharge of Upsilonquitch River at Upsilonquitch, New Brunswick (Drainage area, 877 sq mi; 2,270 sq km)

Outardes River in eastern Quebec increased seasonally, and flow of La Have River in southern Nova Scotia decreased seasonally, but monthly mean discharge in both basins was below the normal range.

In the Rochester area of western New York, flooding occurred May 16–17 along Allen Creek and other streams as a result of intense rains. One stream reached its highest stage in 30 years, according to a local resident.

Elsewhere in the region, flows were above the normal range in southern Maine, northwestern New York, northwestern Pennsylvania, and eastern Maryland.

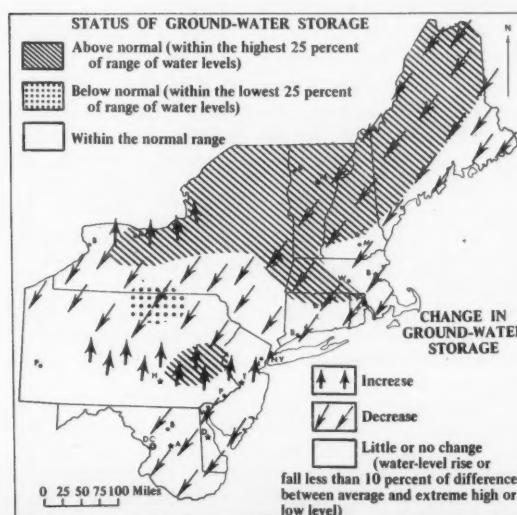
Ground-water levels declined seasonally in most of the region but rose in parts of northwestern New York, south-central Pennsylvania, and north-central New Jersey (see map). Monthend levels were above the normal

In north-central Tennessee, runoff from localized rains of 4 to 5 inches on May 21 caused flooding along small streams in Montgomery, Robertson, and northern Davidson counties. On May 30, thunderstorm rainfall of about 5 inches resulted in flooding along streams in Blount and Loudon Counties, in the southeastern part of the State. At the index station on Emory River at Oakdale, in east-central Tennessee, monthly mean flow decreased seasonally but was almost twice the median flow for May and was in the above-normal range.

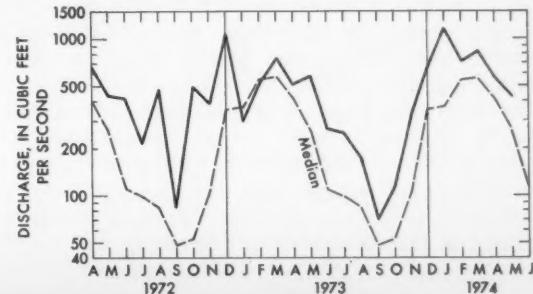
In the eastern Piedmont and Coastal Plain areas of North Carolina, streamflow increased contraseasonally, as a result of above-average rainfall, and monthly mean flows were above the normal range. In the central and western parts of the State, monthly mean discharges decreased seasonally at index stations but remained in the above-normal range for the 2d consecutive month. No flooding occurred although some streams were about half bankfull May 9–10.

In northeastern Mississippi, flow of Tombigbee River at Columbus decreased seasonally, was more than twice the median flow for May, and in the above-normal range, where it has been each month, except March, since October 1973.

In western Virginia, flow of North Fork Holston River near Saltville decreased seasonally, was in the normal range for May, and was typical of flow in many streams of the region (see graph).



Map above shows ground-water storage near end of May and change in ground-water storage from end of April to end of May.



Monthly mean discharge of North Fork Holston River near Saltville, Va. (Drainage area, 222 sq mi; 575 sq km)

In northwestern Florida, flow of Shoal River near Crestview decreased seasonally, was less than the monthly median for the first month since October 1973, and in the below-normal range for the first time since October 1972. In the north-central part of the State, flow of Silver Springs decreased 20 cfs, to 670 cfs; 86 percent of normal, and flow of Suwannee River at Bradford decreased seasonally, and remained in the normal range for the 9th consecutive month. In southern Florida, flow of Peace River increased slightly, from the extremely low flow of April (19 percent of median), but remained below the normal range for the 3d consecutive month. Cumulative runoff at the index station, Peace River at Arcadia, for the first 8 months of 1974 water year, was only about 30 percent of median runoff for that period. Also in southern Florida, flow of Miami Canal at Miami increased 4.0 cfs, to 4.6 cfs; 5 percent of normal, and flow southward through the Tamiami Canal outlets, 40-mile bend to Monroe, increased from 0 cfs in April to 0.5 cfs during May; 17 percent of normal.

Ground-water levels generally declined in Kentucky (except in extreme western part), West Virginia, Alabama, Mississippi, in the Piedmont of Georgia, the Coastal Plain of North Carolina, and in northern and central Florida. Levels continued rising in the Piedmont and mountain areas of North Carolina. In southeastern Florida, levels remained about the same or rose slightly, responding to scattered rains near the end of month. Monthend levels were generally above average in Kentucky and North Carolina, and below average in Florida. In coastal Georgia, levels declined in the heavily pumped Savannah and Brunswick areas.

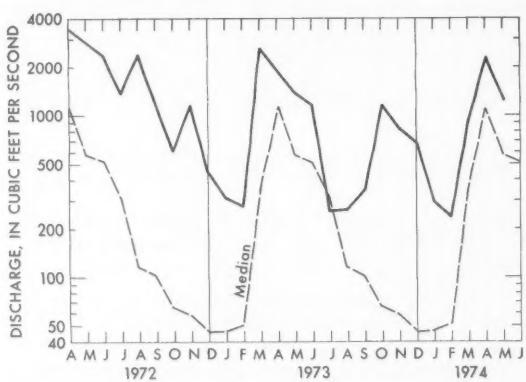
## WESTERN GREAT LAKES REGION

[Ontario; Illinois, Indiana, Michigan, Minnesota, Ohio, and Wisconsin]

STREAMFLOW GENERALLY DECREASED SEASONALLY EXCEPT IN ILLINOIS AND IN PARTS OF SOUTHERN ONTARIO, WHERE CONTRASEASONAL INCREASES OCCURRED. MONTHLY FLOWS WERE ABOVE THE NORMAL RANGE, AND FLOODING OCCURRED, IN MINNESOTA, ILLINOIS, AND PARTS OF INDIANA, MICHIGAN, AND SOUTHEASTERN ONTARIO.

In central and northern parts of Illinois, locally severe rain storms near midmonth caused serious flooding and property damage. Monthly mean flow of Pecatonica River, in the northern part of the State, increased sharply, was almost 4 times median flow for May, and above the normal range, where it has been in 21 of the past 22 months. In south-central Illinois, flow of Sangamon River at Monticello also increased sharply, was in the above normal range, and was more than 3 times the May median discharge. Moderate flooding occurred in the west-central part of Michigan's Lower Peninsula May 17 and 18. Peak stages on Little

Muskegon River near Morley, Bear Creek near Muskegon, and North Branch Kawkawlin River near Kawkawlin, were highest of record. In northwestern Minnesota, some flooding of agricultural land occurred along Roseau River. The levels of lakes and reservoirs in the northern part of Minnesota remained higher than normal and contributed to sustained high streamflows. In the south-central part of the State, monthly mean flow of Crow River at Rockford decreased seasonally, but was more than twice the median flow for May, and in the above-normal range for the 9th consecutive month (see graph). Flooding occurred also along Grand River in



Monthly mean discharge of Crow River at Rockford, Minn.  
(Drainage area, 2,520 sq mi; 6,530 sq km)

southeastern Ontario, and in the Wabash and White River basins in southern Indiana.

Monthly mean flows of Muskegon River at Evart and Red Cedar River at East Lansing, in the Lower Peninsula of Michigan, remained above the normal range for the 5th and 7th consecutive month, respectively.

Ground-water levels generally rose in water-table wells in Michigan, Wisconsin, Minnesota, Indiana, and northern Illinois; and declined slightly in Ohio. Monthend levels remained above average in Michigan and northern Minnesota; were near average in Ohio; were slightly below average in Indiana; and continued below average in southern Minnesota. In the heavily pumped artesian aquifer underlying the Minneapolis-St. Paul area, Minn., area, levels continued to decline and to remain below average.

## MIDCONTINENT

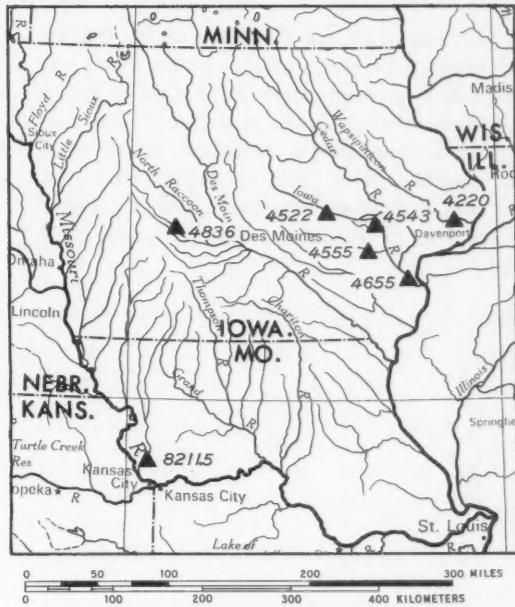
[Manitoba and Saskatchewan; Arkansas, Iowa, Kansas, Louisiana, Missouri, Nebraska, North Dakota, Oklahoma, South Dakota, and Texas]

STREAMFLOW PATTERNS IN THE REGION GENERALLY WERE SEASONAL, INCREASING IN SOME BASINS AND DECREASING IN OTHERS. FLOWS WERE ABOVE NORMAL IN PARTS OF MANITOBA, NORTH DAKOTA, NEBRASKA, IOWA, AND MISSOURI, AND BELOW NORMAL IN

NORTHERN TEXAS. FLOODING OCCURRED IN IOWA, MISSOURI, NORTH DAKOTA, OKLAHOMA, AND LOUISIANA.

Record, or near-record, flood stages and discharges occurred on streams in eastern and central Iowa, and in northwestern Missouri. The accompanying table and map show peak stage and discharge data and locations of selected measurement sites in the flood areas. Two lives were lost and property damage was extensive in Missouri. In Iowa, much cropland was inundated and sheet erosion was severe. Also, many roads were flooded and numerous bridges were damaged or destroyed. In northern North Dakota, most streams were above flood stage at monthend as a result of high carryover flows from April, and precipitation during May that was nearly twice normal.

In extreme south-central Oklahoma, the peak discharge of 32,500 cfs May 1 on Mud Creek near Courtney (drainage area, 572 square miles) was the highest in record that began in October 1960. The recurrence interval for that discharge is 25 years. In southeastern Louisiana, flooding occurred in the Tickfaw River basin as a result of rains in excess of 8 inches at several points May



Location of stream-gaging stations described in table of peak stages and discharges on page 5.

Provisional data; subject to revision

#### STAGES AND DISCHARGES FOR THE FLOODS OF MAY 1974 AT SELECTED SITES IN IOWA AND MISSOURI

WRD station number	Stream and place of determination	Drainage area (square miles)	Period of known floods	Maximum flood previously known			Maximum during present flood				
				Date	Stage (feet)	Discharge (cfs)	Date	Stage (feet)	Discharge	Recurrence interval (years)	
IOWA											
5-4220	Wapsipinicon River near Dewitt.	2,330	1934-	Apr. 22, 1973	12.76	27,000	May 17	13.10	30,400	13.0	20
IOWA RIVER BASIN											
5-4522	Walnut Creek near Hartwick.	70.9	1949-	Sept. 3, 1958	15.67	4,930		28	15.87	6,000	84.6
5-4543	Clear Creek near Coralville.	98.1	1952-	May 29, 1962 Mar. 3, 1970	(a) 13.49	5,390 (a)		17	13.90	6,500	66.3
5-4555	English River at Kalona . . .	573	1939-	Sept. 21, 1965	21.45	20,000		18	20.15	17,000	29.7
5-4655	Iowa River at Wapello . . .	12,499	1914-	June 18, 1947 Apr. 22, 1973	26.14 28.63	94,000 92,000		19	27.75	76,500	6.1
DES MOINES RIVER BASIN											
5-4836	Middle Raccoon River at Panora.	440	1958-	July 3, 1973	13.56	12,000		19	14.78	13,000	29.5
MISSOURI											
PLATTE RIVER BASIN (IOWA-MISSOURI)											
6-82115	Little Platte River at Smithville.	234	1947, 1965-	July (c) 20, 1965	37.4 44.8	(a) 76,600	May 18	39.7	39,200	168	d 1.5

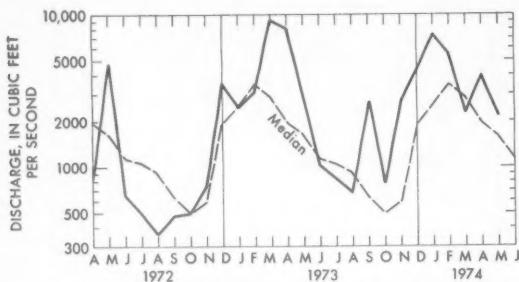
<sup>a</sup>Not determined.

<sup>b</sup>Ratio of discharge to that of the 100-year flood.

<sup>c</sup>Unknown.

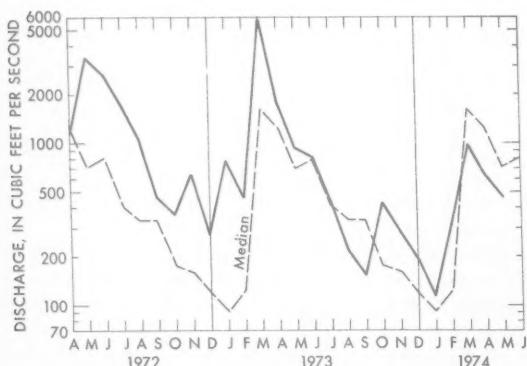
<sup>d</sup>Ratio of discharge to that of the 50-year flood.

22-23. The peak discharge of 17,700 cfs on Tickfaw River at Holden (drainage area, 247 square miles) was the highest in 34 years of record, and is equal to that of a 50-year flood. Many highways in the basin were inundated. Also in southeastern Louisiana and west of Holden, monthly mean flow of Amite River near Denham Springs decreased seasonally, was greater than the median flow for May, and was in the normal range (see graph).



Monthly mean discharge of Amite River near Denham Springs, La.  
(Drainage area, 1,280 sq mi; 3,320 sq km)

In northeastern Nebraska, flow at the index station Elkhorn River at Waterloo increased seasonally and was more than twice the median for May. Heavy rain in the area immediately upstream from Waterloo resulted in a daily mean discharge of 15,000 cfs May 19, highest daily flow for the month since records began in September 1928. In the adjacent areas of South Dakota and Iowa, monthly mean flow of Big Sioux River, as measured at Akron, Iowa, decreased seasonally and was in the normal range (see graph). In western Nebraska, flow of North



Monthly mean discharge of Big Sioux River at Akron, Iowa  
(Drainage area, 9,030 sq mi; 23,400 sq km)

Platte River remained high because of large releases from reservoirs in Wyoming. In the Republican River basin in southwestern Nebraska, all reservoirs except Enders were

filled to the tops of their conservation pools, at month-end, and most irrigation systems in that area were diverting water.

In Texas, streamflow was below the normal range for May over a broad band extending from the Panhandle to the Houston area on the Gulf Coast. Monthly mean flow of North Concho River at the index station near Carlsbad was 0 cfs for the 10th consecutive month.

In Manitoba, flow at the index station, Waterhen River below Waterhen Lake, increased seasonally and was above the normal range. The level of Lake Winnipeg at Gimli averaged 716.68 feet above mean sea level, 3.18 feet above the long-term mean for May, and 1.47 feet higher than last month.

Elsewhere in the region, monthly flows increased in some basins and decreased in others and were in the normal range.

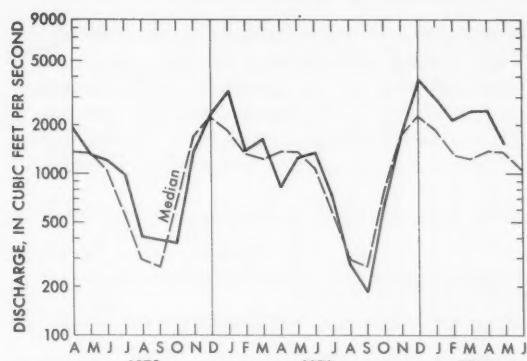
Ground-water levels rose in North Dakota, Iowa, and in the terrace deposits of central Louisiana; were unchanged in the shallow aquifer in the rice-growing area of east-central Arkansas; and declined slightly in Nebraska. In the industrial aquifer of central and southern Arkansas (Sparta Sand), the level in the key well at Pine Bluff was unchanged (remaining nearly at an alltime low); and the level declined at Pine Bluff but continued to be above average. In the Chicot aquifer of southwestern Louisiana, levels continued falling sharply in response to pumping for irrigation. Monthend levels were near average in North Dakota and Nebraska; and were above average in Iowa. In Texas, levels rose in the Edwards Limestone at San Antonio; and declined in the Edwards Limestone at Austin, in the Evangeline aquifer at Houston, and in the bolson deposits at El Paso. Monthend levels were above average at Austin and San Antonio and below average at Houston and El Paso.

## WEST

[Alberta and British Columbia; Arizona, California, Colorado, Idaho, Montana, Nevada, New Mexico, Oregon, Utah, Washington, and Wyoming]

STREAMFLOW INCREASED SEASONALLY IN MOST CENTRAL AND NORTHERN BASINS OF THE REGION BUT DECREASED IN ARIZONA AND NEVADA, AND IN SOME COASTAL AREAS. FLOWS REMAINED ABOVE NORMAL IN A LARGE AREA IN THE NORTHWESTERN PART OF THE REGION AND BELOW NORMAL IN PARTS OF ARIZONA AND NEW MEXICO. AT MONTHEND A CRITICAL FLOOD POTENTIAL EXISTED IN MANY BASINS AT HIGH ELEVATIONS BECAUSE OF UNUSUALLY HEAVY SNOWPACKS AND THE DELAYED SNOWMELT. THE MONTHEND LEVEL OF GREAT SALT LAKE WAS THE HIGHEST SINCE JULY 1929.

At index stations in extreme eastern and western Washington, streamflow generally has remained above the normal range since about November 1973 and cumulative runoff for the past 8 months is about 50 percent greater than median. In adjacent British Columbia, monthly mean flow of Fraser River at Hope remained in the above-normal range for the 2d consecutive month. Also in British Columbia, monthly mean flow of Sproat River near Alberni, on Vancouver Island, decreased seasonally and was in the normal range (see graph). In



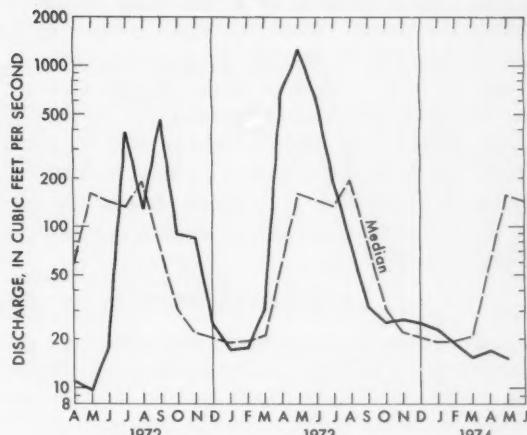
Monthly mean discharge of Sproat River near Alberni, British Columbia (Drainage area, 134 sq mi; 347 sq km)

north-central Oregon, flow of John Day River at Service Creek decreased seasonally and was above the normal range, where it has been during 6 of the past 7 months.

In Idaho, monthly mean flows remained above the normal range in some basins at intermediate and high elevations, but in other basins at still higher elevations, flows were only slightly greater than medians for May because of the low rate of snowmelt. The remaining unusually high snowpack in those basins poses a critical flood threat for June. Flow of Snake River, in eastern Idaho and the adjacent area of western Wyoming, has been above the normal range for 7 consecutive months.

On the eastern and western slopes of the Continental Divide in Colorado, flows of Yampa River at Steamboat Springs and Arkansas River at Canon City, respectively, increased seasonally and were above the normal range.

In New Mexico, flows generally were far below median for May. In the north-central part of the State, monthly mean discharge of Pecos River at Santa Rosa decreased and was only 10 percent of median (see graph). In southwestern New Mexico and the adjacent area of Arizona, flow of Gila River was less than half the median flow for May and below the normal range for the 4th consecutive month. Elsewhere in Arizona, monthly mean flows decreased seasonally and were below the normal range except in the Verde River basin, where normal flow persisted.



Monthly mean discharge of Pecos River at Santa Rosa, N. Mex. (Drainage area, 2,650 sq mi; 6,860 sq km)

In Utah, streamflow was below the normal range in the south and above that range in the north-central part of the State. Also in the north, the level of Great Salt Lake rose 0.2 foot during the month (to 4,201.40 feet above mean sea level), 0.85 foot higher than a year ago, 2.40 feet higher than the average (1904-70) monthly level for May, 10.05 feet higher than the alltime low level of October 1963, and the highest level reached by the lake since July 1929.

Contents of the Colorado River Storage Project increased 1,696,800 acre-feet during the month. Storage in Lake Powell reservoir increased 1,284,000 acre-feet and was at 77.5 percent of capacity at monthend.

Ground-water levels generally rose in Montana and southwestern Idaho (highest in 40 years of record at one shallow well in the Boise area); and declined in Utah (heavy pumping for irrigation) and southern Arizona. In southern New Mexico, changes in level were minimal except for declines in the intake and withdrawal areas of the Roswell artesian basin. In the Snake River Group (aquifer) of southern Idaho, levels rose at Gooding in the west, and were unchanged at Atomic City in the east. Monthend levels were above average in Montana, western Washington, and in Nevada (except in the heavily pumped Las Vegas Valley and Truckee Meadows areas); remained about the same in key observation wells in southern California; and were below average.

## ALASKA

The snowmelt period started early because of above-normal air temperatures but snowpack generally was below normal in much of the State. Streamflow increased seasonally and was in the normal range except in the southeast, where monthly mean flow of Gold

Creek near Juneau remained below that range for the 7th consecutive month. Cumulative runoff at that site for the first 8 months of the 1974 water year was only about half the median. In central Alaska, monthly mean flow of Tanana River at Nenana increased into the normal range, after 4 consecutive months of flow below that range. Also in the central part of the State, monthly mean flow of Chena River at Fairbanks increased seasonally but remained below median, where it has been since October 1973.

## HAWAII

Streamflow decreased seasonally in all parts of the State and was in the normal range except on the islands of Maui and Kauai. At the index station, Honopou Stream near Huelo, Maui, monthly mean discharge was below the normal range and only half the median for May. On the island of Kauai, flow of East Branch of North Fork Wailua River near Lihue, remained above the normal range for the 2d consecutive month and was twice the median flow for May.

### BASIC DATA REPORTS ON QUALITY OF SURFACE WATER

The four water-supply papers listed below have been published within recent months by the Geological Survey. They supplement a listing of similar reports in the August 1973 and January 1974 issues of the Water Resources Review. These water-supply papers contain data on chemical and biological quality, suspended sediment, and temperature of surface waters during the 1968 water year (October 1, 1967 through September 30, 1968). The data result from water investigations by the Survey, many of which are carried on in cooperation with State, Federal, and other cooperating agencies. The part number shown in the title of each report corresponds to the respective region number on the map at the bottom of this page.

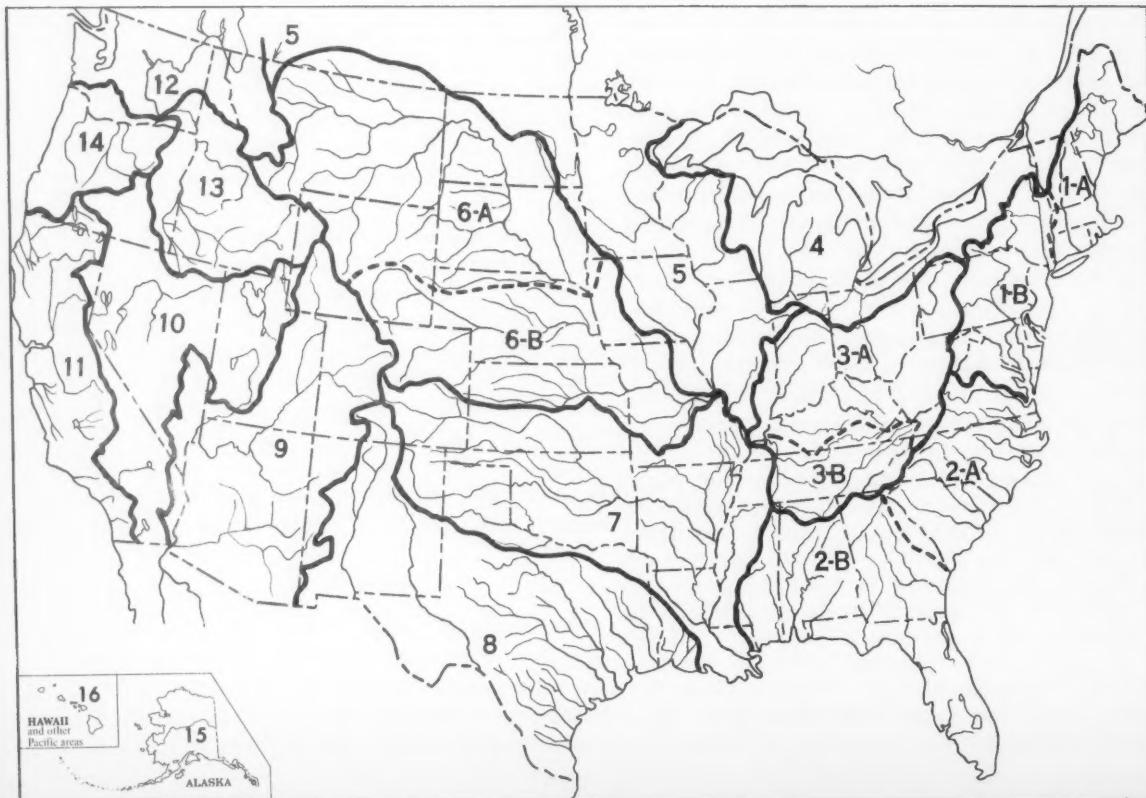
Each report is available for purchase at the price shown from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402.

Quality of surface waters of the United States, 1968, Part 2, South Atlantic slope and eastern Gulf of Mexico basins: U.S. Geological Survey Water-Supply Paper 2092, 373 pages, 1973. \$2.35.

Quality of surface waters of the United States, 1968, Part 7, Lower Mississippi River basin: U.S. Geological Survey Water-Supply Paper 2096, 438 pages, 1973. \$2.95.

Quality of surface waters of the United States, 1968, Parts 9 and 10, Colorado River basin and the Great Basin: U.S. Geological Survey Water-Supply Paper 2098, 296 pages, 1973. \$2.35.

Quality of surface waters of the United States, 1968, Parts 12-16, North Pacific slope basins, Alaska, Hawaii, and other Pacific areas: U.S. Geological Survey Water-Supply Paper 2100, 464 pages, 1973. \$3.05.



## USABLE CONTENTS OF SELECTED RESERVOIRS NEAR END OF MAY 1974

[Contents are expressed in percent of reservoir capacity. The usable storage capacity of each reservoir is shown in the column headed "Normal maximum."]

Reservoir		End of Apr. 1974	End of May 1974	End of May 1973	Average for end of May	Normal maximum	Reservoir		End of Apr. 1974	End of May 1974	End of May 1973	Average for end of May	Normal maximum	
Principal uses: F—Flood control I—Irrigation M—Municipal P—Power R—Recreation W—Industrial	Percent of normal maximum						Principal uses: F—Flood control I—Irrigation M—Municipal P—Power R—Recreation W—Industrial	Percent of normal maximum						
<b>NORTHEAST REGION</b>														
NOVA SCOTIA														
Rossignol, Mulgrave, Falls Lake, St. Margaret's Bay, Black, and Ponhook Reservoirs (P)	86	78	84	78	223,400 (a)		Lake Sakakawea (Garrison) (FIPR)	85	85	91	....	22,640,000 ac-ft		
QUEBEC							Lake McConaughy (IP)	82	83	92	79	1,948,000 ac-ft		
Gouin (P)	54	87	71	59	6,954,000 ac-ft		NEBRASKA							
Allard (P)	100	97	94	87	280,600 ac-ft		Keystone (FPR)	109	133	113	98	661,000 ac-ft		
MAINE							Lake O' The Cherokees (FPR)	87	97	104	85	1,492,000 ac-ft		
Seven reservoir systems (MP)	95	96	99	98	178,489 mcf		Tenkille Ferry (FPR)	109	101	117	102	628,200 ac-ft		
NEW HAMPSHIRE							Lake Altus (FIMR)	55	62	68	65	134,500 ac-ft		
Lake Winnipesaukee (PR)	101	103	108	101	7,200 mcf		Eufaula (FPR)	98	103	104	88	2,378,000 ac-ft		
Lake Francis (FPR)	83	96	88	81	4,326 mcf		OKLAHOMA							
First Connecticut Lake (P)	74	94	95	86	3,330 mcf		Keystone (FPR)	109	133	113	98	661,000 ac-ft		
VERMONT							Lake O' The Cherokees (FPR)	87	97	104	85	1,492,000 ac-ft		
Somerset (P)	84	98	97	86	2,500 mcf		Tenkille Ferry (FPR)	109	101	117	102	628,200 ac-ft		
Harriman (P)	87	90	75	87	5,060 mcf		Lake Altus (FIMR)	55	62	68	65	134,500 ac-ft		
MASSACHUSETTS							Eufaula (FPR)	98	103	104	88	2,378,000 ac-ft		
Cobble Mountain and Borden Brook (MP)	87	89	94	90	3,394 mcf		OKLAHOMA—TEXAS							
NEW YORK							Lake Texoma (FMPRW)	102	101	105	103	2,722,000 ac-ft		
Great Sacandaga Lake (FPR)	100	100	100	98	34,270 mcf		TEXAS							
Indian Lake (FMP)	86	104	109	104	4,500 mcf		Possum Kingdom (IMP RW)	82	83	91	83	724,500 ac-ft		
New York City reservoir system (MW)	98	100	104	....	547,500 mg		Buchanan (IMPW)	83	86	76	85	955,200 ac-ft		
NEW JERSEY							Bridgeport (IMW)	53	54	60	49	386,400 ac-ft		
Wanaque (M)	99	99	100	94	27,730 mg		Eagle Mountain (IMW)	94	91	100	91	190,300 ac-ft		
PENNSYLVANIA							Medina Lake (I)	95	100	98	51	254,000 ac-ft		
Wallenpaupack (P)	73	86	90	85	6,875 mcf		Lake Travis (FIMPRW)	95	98	99	80	1,144,000 ac-ft		
Pymatuning (FMR)	98	100	102	99	8,191 mcf		Lake Kemp (IMW)	47	52	53	79	319,600 ac-ft		
MARYLAND							THE WEST							
Baltimore municipal system (M)	100	100	101	94	85,340 mg		ALBERTA							
SOUTHEAST REGION							Spray (P)	....	....	32	22	210,000 ac-ft		
NORTH CAROLINA							Lake Minnewanka (P)	....	....	65	33	199,700 ac-ft		
Bridgewater (Lake James) (P)	96	95	100	91	12,580 mcf		St. Mary (I)	....	....	84	79	320,800 ac-ft		
High Rock Lake (P)	86	93	96	81	10,230 mcf		WASHINGTON							
Narrows (Badin Lake) (P)	97	98	99	100	5,616 mcf		Franklin D. Roosevelt Lake (IP)	0	17	33	75	5,232,000 ac-ft		
SOUTH CAROLINA							Lake Cheelan (P)	27	55	62	75	676,100 ac-ft		
Lake Murray (P)	92	94	96	81	70,300 mcf		IDAHO—WYOMING							
Lakes Marion and Moultrie (P)	86	87	86	77	81,100 mcf		Upper Snake River (7 reservoirs) (IMP)	60	63	83	83	4,282,000 ac-ft		
SOUTH CAROLINA—GEORGIA							WYOMING							
Clark Hill (FP)	77	77	86	75	75,360 mcf		Pathfinder, Seminole, Alcova, Kortes, Glendo, and Guernsey Reservoirs (I)	69	78	97	53	3,056,200 ac-ft		
GEORGIA							Buffalo Bill (IP)	42	49	57	76	421,300 ac-ft		
Burton (PR)	99	100	102	93	104,000 ac-ft		Boysen (FIP)	68	67	85	64	802,000 ac-ft		
Lake Sidney Lanier (FMPR)	67	68	70	67	1,686,000 ac-ft		Keyhole (F)	84	83	87	40	199,900 ac-ft		
Sinclair (MPR)	88	91	92	94	214,000 ac-ft		COLORADO							
ALABAMA							John Martin (FIR)	0	0	12	16	364,400 ac-ft		
Lake Martin (P)	95	98	100	94	1,373,000 ac-ft		Colorado—Big Thompson project (I)	82	91	83	62	722,600 ac-ft		
TENNESSEE VALLEY							Taylor Park (IR)	61	81	55	74	106,000 ac-ft		
Clinch Projects: Norris and Melton Hill Lakes (FPR)	63	68	83	65	1,156,000 cfsd		COLORADO RIVER STORAGE PROJECT							
Holston Projects: South Holston, Watauga, Boone, Fort Patrick Henry, and Cherokee Lakes (FPR)	79	85	91	69	1,452,000 cfsd		Lake Powell; Flaming Gorge, Navajo, and Blue Mesa Reservoirs (FIPR)	72	78	61	....	31,276,500		
Douglas Lake (FPR)	67	82	97	69	703,100 cfsd		UTAH—IDAHO							
Hiwassee Projects: Chatuge, Nottely, Hiwassee, Apalachia, Blue Ridge, Ocoee 3, and Parksville Lakes (FPR)	83	87	95	82	512,200 cfsd		Bear Lake (IPR)	81	89	87	66	1,421,000 ac-ft		
Little Tennessee Projects: Nantahala, Thorpe, Fontana, and Chilhowee Lakes (FPR)	86	93	99	84	745,200 cfsd		CALIFORNIA							
WESTERN GREAT LAKES REGION							Heitch Hetchy (MP)	48	79	76	70	360,400 ac-ft		
WISCONSIN							Lake Almanor (P)	105	107	88	61	1,036,000 ac-ft		
Chippewa and Flambeau (PR)	65	94	99	86	15,900 mcf		Shasta Lake (FIPR)	99	104	100	93	4,377,000 ac-ft		
Wisconsin River (21 reservoirs) (PR)	70	80	94	82	17,400 mcf		Millerton Lake (FI)	89	88	88	81	503,200 ac-ft		
MINNESOTA							Pine Flat (FI)	83	92	79	70	1,014,000 ac-ft		
Mississippi River headwater system (FMR)	37	42	29	37	1,640,000 ac-ft		Isabella (FIR)	51	71	50	40	551,800 ac-ft		

\*Thousands of kilowatt-hours

## METRIC EQUIVALENTS OF UNITS USED IN THE WATER RESOURCES REVIEW

(Round-number conversions, to nearest four significant figures)

1 foot = 0.3048 meter 1 mile = 1.609 kilometers

1 acre = 0.4047 hectare = 4,047 square meters

1 square mile (sq mi) = 259 hectares = 2.59 square kilometers (sq km)

1 acre-foot (ac-ft) = 1,233 cubic meters

1 million cubic feet (mcf) = 28,320 cubic meters

1 cubic foot per second (cfs) = 0.02832 cubic meters per second = 1.699 cubic meters per minute

1 second-foot-day (cfsd) = 2,447 cubic meters per day

1 million gallons (mg) = 3,785 cubic meters = 3.785 million liters

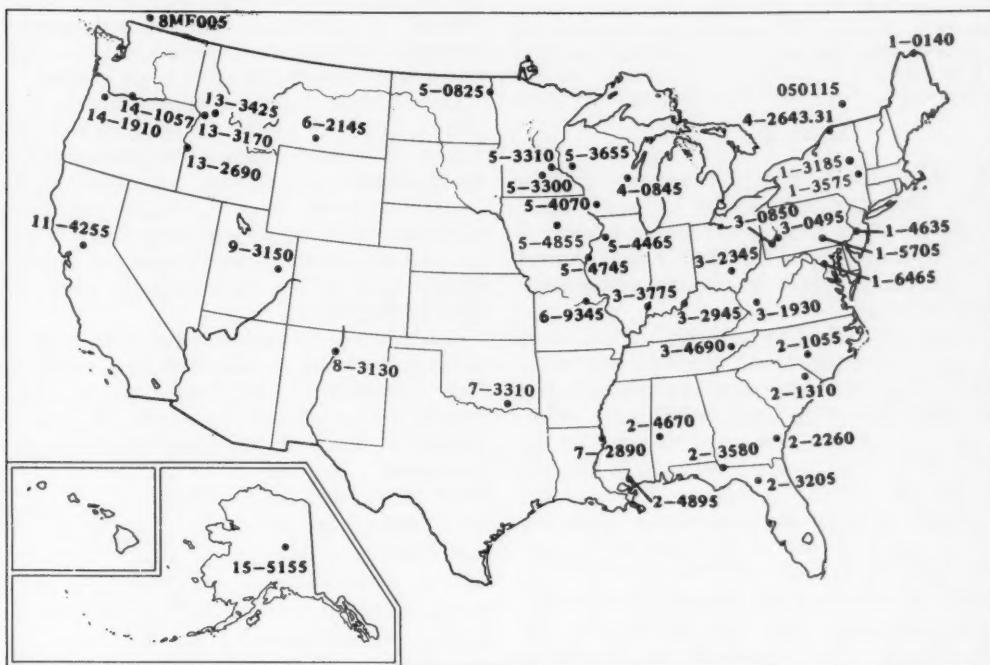
1 million gallons per day (mgd) = 694.4 gallons per minute (gpm) = 2,629 cubic meters per minute = 3,785 cubic meters per day

## FLOW OF LARGE RIVERS DURING MAY 1974

Station number	Stream and place of determination	Drainage area (square miles)	Mean annual discharge through September 1970 (cfs)	May 1974				Discharge near end of month		
				Monthly discharge (cfs)	Percent of median monthly discharge, 1941-70	Change in discharge from previous month (percent)				
				(cfs)	(mgd)	Date				
1-0140	St. John River below Fish River at Fort Kent, Maine.	5,690	9,397	62,130	199	+367	36,500	23,600	31	
1-3185	Hudson River at Hadley, N.Y. ....	1,664	2,791	6,047	135	-18	3,000	1,900	31	
1-3575	Mohawk River at Cohoes, N.Y. ....	3,456	5,450	8,506	139	-68	.....	.....	.....	
1-4635	Delaware River at Trenton, N.J. ....	6,780	11,360	14,540	102	-44	8,270	5,300	31	
1-5705	Susquehanna River at Harrisburg, Pa. ....	24,100	33,670	36,660	73	-56	24,000	15,500	31	
1-6465	Potomac River near Washington, D.C. ....	11,560	10,640	10,700	80	-50	5,840	3,800	31	
2-1055	Cape Fear River at William O. Huske Lock near Tarheel, N.C. ....	4,810	4,847	6,213	197	-6	6,730	4,300	31	
2-1310	Pee Dee River at PeeDee, S.C. ....	8,830	9,098	10,400	146	-46	14,500	9,400	30	
2-2260	Altamaha River at Doctortown, Ga. ....	13,600	13,380	7,607	63	-67	7,080	4,600	25	
2-3205	Sewanee River at Branford, Fla. ....	7,740	6,775	5,540	83	-37	5,530	3,600	25	
2-3580	Apalachicola River at Chattahoochee, Fla. ....	17,200	21,690	17,900	89	-54	19,000	12,300	31	
2-4670	Tombigbee River at Demopolis lock and dam near Coatopa, Ala. ....	15,400	21,700	24,240	154	-65	36,500	23,600	23	
2-4895	Pearl River near Bogalusa, La. ....	6,630	8,533	11,900	120	-70	5,520	3,600	29	
3-0495	Allegheny River at Natrona, Pa. ....	11,410	18,700	27,160	113	-18	12,400	8,000	29	
3-0850	Monongahela River at Braddock, Pa. ....	7,337	11,950	12,240	89	-30	4,950	3,200	29	
3-1930	Kanawha River at Kanawha Falls, W.Va. ....	8,367	12,370	14,480	115	-11	8,950	5,800	26	
3-2345	Scioto River at Higby, Ohio ....	5,131	4,337	3,636	64	-66	2,100	1,400	31	
3-2945	Ohio River at Louisville, Ky. <sup>2</sup> ....	91,170	110,600	127,600	95	-41	117,600	76,000	27	
3-3775	Wabash River at Mount Carmel, Ill. ....	28,600	26,310	51,780	149	-20	81,000	52,400	31	
3-4690	French Broad River below Douglas Dam, Tenn. ....	4,543	1' 6,528	9,928	156	-39	.....	.....	.....	
4-0845	Fox River at Rapide Croche Dam, near Wrightstown, Wis. <sup>2</sup> ....	6,150	4,142	6,300	133	-32	.....	.....	.....	
4-2643.31	St. Lawrence River at Cornwall, Ontario—near Massena, N.Y. <sup>3</sup> ....	299,000	239,100	308,000	120	-1	308,000	199,100	29	
050115	St. Maurice River at Grand Mere, Quebec. ....	16,300	24,900	174,000	297	+500	122,000	78,900	29	
5-0825	Red River of the North at Grand Forks, N. Dak. ....	30,100	2,439	13,270	292	-23	8,800	5,700	31	
5-3300	Minnesota River near Jordan, Minn. ....	16,200	3,306	5,060	99	-24	4,990	3,200	31	
5-3310	Mississippi River at St. Paul, Minn. ....	36,800	10,230	25,800	121	-2	22,600	14,600	30	
5-3655	Chippewa River at Chippewa Falls, Wis. ....	5,600	5,062	5,945	87	-51	.....	.....	.....	
5-4070	Wisconsin River at Muscoda, Wis. ....	10,300	8,457	11,390	107	-29	.....	.....	.....	
5-4465	Rock River near Joslin, Ill. ....	9,520	5,288	21,920	350	+40	21,900	14,200	30	
5-4745	Mississippi River at Keokuk, Iowa ....	119,000	61,210	171,800	197	+30	194,000	125,000	31	
5-4855	Des Moines River below Raccoon River at Des Moines, Iowa. ....	9,879	3,796	16,000	278	.....	17,000	10,900	31	
6-2145	Yellowstone River at Billings, Mont. ....	11,795	6,754	9,522	73	+112	23,000	14,900	31	
6-9345	Missouri River at Hermann, Mo. ....	528,200	78,480	144,600	159	+68	113,000	73,000	28	
7-2890	Mississippi River near Vicksburg, Miss. <sup>4</sup> ....	1,144,500	552,700	828,100	97	-23	939,000	607,000	28	
7-3310	Washita River near Durwood, Okla. ....	7,202	1,379	2,900	140	+340	260	170	31	
8-3130	Rio Grande at Otowi Bridge, near San Ildefonso, N.Mex. ....	14,300	1,530	1,768	69	+41	.....	.....	.....	
9-3150	Green River at Green River, Utah ....	40,600	6,369	21,450	151	+166	16,000	10,300	31	
11-4255	Sacramento River at Verona, Calif. ....	21,257	18,370	23,840	123	-58	22,100	14,300	28	
13-2690	Snake River at Weiser, Idaho ....	69,200	17,670	38,890	154	-20	36,400	23,500	28	
13-3170	Salmon River at White Bird, Idaho ....	13,550	11,060	35,610	112	+136	70,000	45,200	31	
13-3425	Clearwater River at Spalding, Idaho ....	9,570	15,320	37,890	74	-3	46,600	30,100	28	
14-1057	Columbia River at The Dalles, Oreg. <sup>5</sup> ....	237,000	194,000	356,000	106	+22	.....	.....	.....	
14-1910	Willamette River at Salem, Oreg. ....	7,280	23,370	20,770	99	-50	21,000	13,600	28	
15-5155	Tanana River at Nenana, Alaska ....	25,600	24,040	26,570	73	+380	.....	.....	.....	
8MF005	Fraser River at Hope, British Columbia. ....	78,300	95,300	210,000	118	+155	248,000	160,000	30	

<sup>1</sup> Adjusted.<sup>2</sup> Records furnished by Corps of Engineers.<sup>3</sup> Records furnished by Buffalo District, Corps of Engineers, through International St. Lawrence River Board of Control. Discharges shown are considered to be the same as discharge at Ogdensburg, N.Y. when adjusted for storage in Lake St. Lawrence.<sup>4</sup> Records of daily discharge computed jointly by Corps of Engineers and Geological Survey.<sup>5</sup> Discharge determined from information furnished by Bureau of Reclamation, Corps of Engineers, and Geological Survey.

## SELECTED STREAM-GAGING STATIONS ON LARGE RIVERS



Location of stream-gaging stations on large rivers listed in table on page 10.

### WATER RESOURCES REVIEW

MAY 1974

*Cover map* shows generalized pattern of streamflow for May based on 22 index stream-gaging stations in Canada and 130 index stations in the United States. Alaska and Hawaii inset maps show streamflow only at the index gaging stations which are located near the points shown by the arrows.

Streamflow for May 1974 is compared with flow for May in the 30-year reference period 1931–60 or 1941–70. Streamflow is considered to be *below the normal range* if it is within the range of the low flows that have occurred 25 percent of the time (below the lower quartile) during the reference period. Flow for May is considered to be *above the normal range* if it is within the range of the high flows that have occurred 25 percent of the time (above the upper quartile).

Flow higher than the lower quartile but lower than the upper quartile is described as being within the *normal range*. In the Water Resources Review the median is obtained by ranking the 30 flows of the reference period in their order of magnitude; the highest flow is number 1, the lowest flow is number 30, and the average of the 15th and 16th highest flows is the median.

The normal is an average (but not an arithmetic average) or middle value; half of the time you would expect the May flows to be below the median and half of the time to be above the median. Shorter reference periods are used for the Alaska index stations because of the limited records available.

Statements about *ground-water levels* refer to conditions near the end of May. Water level in each key observation well is compared with average level for the end of May determined from the entire past record for that well or from a 20-year reference period, 1951–70. *Changes in ground-water levels*, unless described otherwise, are from the end of April to the end of May.

The Water Resources Review is published monthly. Special-purpose and summary issues are also published. Issues of the Review are free on application to the Water Resources Review, U.S. Geological Survey, Reston, Virginia 22092.

This issue was prepared by J.C. Kammerer, H.D. Brice, T.H. Woodard, J.K. Reid and L.C. Fleshmon from reports of the field offices, June 7, 1974.

## GROUND WATER IN THE EUGENE-SPRINGFIELD AREA, WILLAMETTE VALLEY, OREGON

The accompanying abstract and graph are from the report, *Ground water in the Eugene-Springfield area, southern Willamette Valley, Oregon*, by F. J. Frank: U.S. Geological Survey Water-Supply Paper 2018, 65 pages, 1973; prepared in cooperation with the Oregon State Engineer. The report may be purchased for \$2.75 from the Superintendent of Documents, Government Printing Office, Washington, D.C. 20402 (GPO Stock Number 2401-00277).

### ABSTRACT

The cities of Eugene and Springfield and their outlying suburban and rural districts constitute an area of rapid population growth where progressively greater volumes of ground water are being required for irrigation and industrial and public supplies. The area is also one of diverse geologic and hydrologic conditions.

As used in this report, the Eugene-Springfield area covers about 450 square miles (fig. 1) and includes a part of the lower foothills of the Coast and Cascade Ranges and a strip of the main valley plain of the southern Willamette Valley. Volcanic and sedimentary rock units exposed in the foothills range in age from Eocene to Miocene. In the main valley plain the older units are overlain by Pleistocene and Holocene alluvial deposits. Marine-deposited sandstone, siltstone, shale, and mudstone of the older sedimentary units are fine grained and poorly permeable and yield water slowly to wells. The volcanic rocks, primarily of dacitic and andesitic composition, yield small quantities of water that are generally adequate only for domestic use. The alluvial deposits (sand and gravel) of the valley plain (central lowland) contain the most productive aquifers in the area and are considered to be the only ground-water reservoir for which large-scale development of ground-water supplies is feasible.

Aquifers in the area are recharged principally by direct infiltration of precipitation. Most of the precipitation, which averages about 40 inches per year, occurs during late autumn and winter (fig. 2). Minimum recharge by infiltration of precipitation to the alluvial aquifers beneath the valley plain is estimated to be about 100,000 acre-feet. Ground water is discharged naturally from the central lowland by seepage and spring flow to small streams, by subsurface outflow to adjacent areas, and by evapotranspiration.

Storage capacity of the central lowland in the Eugene-Springfield area is estimated to be about 2.1 million acre-feet in the zone 10–150 feet below land surface. The quantity of ground water available annually from this area is far greater than the 23,000 acre-feet pumped for all uses in 1968. This pumpage was about 23 percent of the perennial yield (100,000 acre-ft), and about 77,000 acre-feet of water was left available for additional withdrawal. If annual withdrawals of water were

increased to 100,000 acre-feet per year, the levels in the ground-water reservoir would be lowered. Once new equilibria are established, increased withdrawals could be accommodated without progressive losses in aquifer storage or excessive losses in flow of the larger streams.

Ground water from the alluvial deposits of the valley plain is chemically suitable for irrigation and other uses, as is most of the water obtained from perched-water bodies in the sedimentary and volcanic rocks. However, the mineral content of water from the older sedimentary rocks, particularly from deeper producing zones, is greater than the mineral content of water from the alluvial deposits. Locally, some of the water from the older rocks is too saline for most uses.

Increased use of ground water may result in certain problems pertaining to waste-disposal practices, local over-draft of aquifers, well interference, and well construction. Present data are adequate to evaluate some of the factors relating to foreseeable problems but allow only tentative conclusions to be drawn about other factors, which include local direction of flow, rate of ground-water movement, and areas of possible ground-water contamination. Additional information obtained through systematic study will be needed to deal with these problems.



Figure 1.—Map of Oregon showing location of the Eugene-Springfield area.

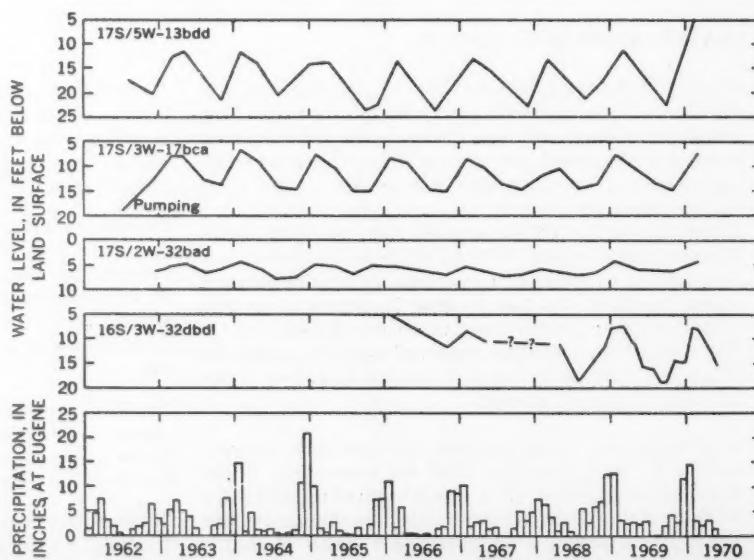


Figure 2.—Hydrographs showing changes in water levels of observation wells in relation to precipitation.





